# Technology Demonstration Fact Sheet
## *Concrete Spaller*


**SUMMARY**

The Hanford Site C Reactor Technology Demonstration Group demonstrated the Concrete Spaller developed by Battelle Pacific Northwest National Laboratory (PNNL) in Richland, WA. The Concrete Spaller (prototype, Model No. 001) is a hand-held concrete and coating removal tool that includes a 9-ton hydraulic cylinder and a patented spalling bit that is inserted into a pre-drilled 1"-diameter hole, and removes an area of concrete surface from about 7" to 16" in diameter. It is suitable for flat (or slightly curved) concrete walls and floors. For decommissioning and decontamination (D&D) projects, it can be used for radiological decontamination of large areas or hot spots, obtaining samples of concrete, and for in-depth removal from cracks in concrete. The demonstration was done to decontaminate two areas on the exhaust fan room wall to free-release levels.

Comparisons and results of the innovative technical demonstration and demonstrations of baseline tools were as follows:

- Less vibration for the operator
- Hand-held, portable
- Increased performance factor of >300% compared to scaler, and 177% compared to scabbler, but 17% slower than diamond grinder.
- Spalling process produces very little dust.


**INNOVATIVE TECHNOLOGY DESCRIPTION**

The demonstration was conducted in two areas on the exhaust fan room wall. The prototype concrete spaller is a hand-held concrete and coating removal tool that includes a 9-ton hydraulic cylinder and a patented spalling bit, suitable for flat (or slightly curved) walls and floors. While most of the demonstration was performed with an unlubricated bit, for best results and longer bit life the hardened-steel spalling bit should be lubricated with molybdenum disulfide spray about every 4 spalls. This can be accomplished without significantly slowing the spalling process. The unit is designed to be operated by a 10,000-psi hydraulic pump, such as the one made by Enerpac company of Bulter, Wisconsin. This pump consumes 19.5 amps at 110V, and weighs 108 lbs.

Depth of spalling varies from 2" at the pilot hole location to about 1/8" at the edge of the spall. Minimum depth is regulated by hole spacing, which is normally on 8" centers.

The unit is designed to work with a detachable shroud that has a vacuum port. For beta/gamma decontamination, no vacuum was applied. For alpha decontamination, there is a potential for contamination to become airborne, and a vacuum filtration unit would be connected by hose to the shroud vacuum port.

Performance figures:

- Decontamination area 50 sf
- Total duration for full decon depth 2.5 hours
- Decontamination rate 20 sf/hr

**BASELINE TECHNOLOGY DESCRIPTION**

A baseline demonstration was conducted with two Pentek tools during October 7, 1997 through November 3, 1997 at two C Reactor sample rooms walls and floors. The innovative spaller is also being compared to a concrete grinder demonstrated November 12 and December 1, 1997 in two other C Reactor sample rooms.

The sample rooms required 1/16" - 1/8" concrete removal from floors and walls. The sample rooms were painted with lead-based paint on the floor only.

The first baseline decontamination tools demonstrated were a Pentek pneumatic scaler and scabbler, connected to a vacuum filtration system.

The Pentek Roto-Peen scaler is designed to remove concrete surfaces between 1/16" and 1/4" depths. It contains a flapper device used to strike concrete surfaces. This tool is also useful in hard-to-reach horizontal areas, such as under equipment. The scaler has a port that was connected to a HEPA vacuum filtration system. The other pneumatic baseline tool demonstrated was a Pentek scabbler designed to remove concrete surfaces between 1/8" and 1/4" depths. It is a single-piston hand-held scabbler that can reach medium-congested areas and next to wall/floor intersections. It uses vacuum airflow for low-dust operations (HEPA suction at striking point).

The concrete grinder (diamond wheel) was successfully demonstrated on Nov. 12 and Dec. 1, 1997, and is now in the tool box for use at C Reactor. The grinder has a shroud with a port that was connected to a vacuum filtration system. It is capable of removing 1/8" of material at a rate of 0.4 sf/min. The concrete grinder leaves a smooth surface that can be surveyed for contamination easily, and decontaminated concrete at a higher rate than the spaller.

## DEMONSTRATION DESCRIPTION

The Concrete Spaller decontaminated 50 sf of walls in 2.5 hours. It removed 1/8" or more of concrete with each spall.

## DETAILS OF BENEFITS

- Decontaminates 0.33 sf/min (20 sf/hour)
- Decontaminated wall thoroughly with very little dust production
- Hardened steel bit lasts for about 400 holes
- Removes material to a greater depth than the baseline tools, much better for areas of cracked concrete

## SUCCESS CRITERIA

- Maneuverability around/over wall protrusions
- Simple to deploy, requiring minimal skill levels
- Better production rate than two of the three baseline tools
- Less vibration than the baseline tools
- Low dust production

**Comparison to Baseline**

| Tech. Type | Baseline | | | Innovative |
|---|---|---|---|---|
| Technology Name | Single-Piston Scabbler | Scaler | Concrete Grinder | Concrete Spaller |
| Area Decon | 42sf | 59sf | 54sf | 50sf |
| Depth Removed | 1/8" | 1/8" | 1/16” | 1/8" to 2" |
| Duration of Work | 11.8 hr | 10.3 hr | 1.13 hr | 2.5 hr |
| Duration for 1/8" depth | 11.8 hr | 10.3 hr | 2.26 hr | 2.5 hr |
| Sf/min at 1/8" depth | .059 | .095 | .40 | .33 |

## SCHEDULE

The innovative tool was used January 16 through January 27, 1998.

## FUTURE APPLICABILITY

The Concrete Spaller system such as the one demonstrated can best be used for decontamination of or taking samples from concrete slabs, floors and walls. Potential applications at C Reactor would include walls and floors in tunnels, Fuel Storage Basin and Transfer Bay areas. The demonstration unit was purchased, to be put in the “tool box”, for more effectively completing project work scope.

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